

REMARKS

The claims are 15 to 26.

The above amendment is responsive to points set forth in the Official Action.

In this regard, a new set of claims is presented in which new claim 15 replaces previous claim 1. New claim 15 does not recite the feature of paragraph b) of previous claim 1.

The remaining claims 16 to 26 are based on previous claims 2 to 8 and 10 to 14, respectively.

The significance of these claims will be further apparent from the remarks below.

Claims 1 to 3, 5 to 7, 9, and 12 to 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Kokubo et al. (US 3,637,686) for reasons of record.

This rejection is respectfully traversed.

A brief discussion of the present invention will be of assistance in appreciating applicant's reasons for traversal of the rejection.

It is the object of the present invention to cool the crude melamine melt by incorporating further ammonia to just above the melting point, i.e. about 1 to 50 °C, followed by solidification and aqueous working up (see page 2, lines 20 to 27 of the present specification).

The cooling should be down to a temperature of about 1 to 50 °C above the respective melting point of melamine, preferably to a temperature of about 1 to 30 °C above the melting point and particularly advantageously the cooling should be effected to a temperature which is as close as possible above the melting point of melamine (see page 4, lines 22 to 29).

Cooling to a temperature at or below the melting point of melamine would result at least partially in solid melamine. The melamine melt prepared from urea in a high pressure process (claim 15) is obtained in a high pressure reactor, from which it must be passed into another vessel, where it is quenched with water. It is evident to the person skilled in the art that solidification or even partial solidification of the melt would plug the lines, the valves, the reactor and is therefore to be avoided.

The argument of the rejection that applicant does not show how to control the temperature to such an extent that one degree variation is never permitted, is respectfully traversed. It is conventional plant operation to adjust the conditions to operate the plant in such a way that the temperature of the melt is always above the melting point with a safety interval of the temperature which fits the plant. Applicant's teaching is to come as close as possible to this limit, since this temperature leads to better results. Applicant's teaching is not how to maintain a melt in a vessel at a certain predetermined temperature, which is well within the skill of the art.

It is true that, generally speaking, small variations are permissible, but a variation to include a temperature which results in solidification of melamine is not permissible, if the specification and the object of the present invention are understood.

Claims 1 to 3, 5 to 7, 9 to 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kokubo et al. (US 3,637,686) in view of Elvers et al. (Ullmann's Encyclopedia of Industrial Chemistry, 5th Edition, vol A16, 174-179, 1978) for reasons of record.

This rejection is also respectfully traversed.

In column 2, lines 30 to 72, Kokubo explains that for the purpose of inhibiting deammoniating condensation and hydrolysis of melamine, the method of cooling with pressurized liquid ammonia or cool ammonia gas would be most effective, but this could never be industrially profitable (lines 30 to 35). The teaching of Kokubo is that at less than 300 °C, deammoniating condensation of melamine hardly occurs, and that at less than 270 °C, under the partial pressure of ammonia, the hydrolysis of melamine hardly takes place (lines 38 to 45). Therefore Kokubo teaches a two step cooling using two completely different cooling media. In the first step, cooling is effected with uniformly atomized liquid ammonia or cool ammonia-gas at 200 to 270 °C and 5 to 100 kg/m², and in the second step which takes place after the solidification of melamine, cooling is effected by means of an aqueous solution containing ammonia at 100 to 200 °C (lines 50 to 64).

In contrast to Kokubo, applicant has found that under his conditions, i.e. by cooling the crude melamine with (liquid) ammonia to a temperature which is close to, but above the melting point, followed by quenching the melt with an aqueous, NH₃-containing medium, solid melamine

can be obtained in higher purity and higher yield. This can only be accomplished if hydrolysis hardly occurs, even at temperatures slightly above the melting point of melamine, which is in contrast to the teaching of Kokubo, who expects hydrolysis of melamine at above 300 °C and teaches water-treatment of solid melamine.

On page 4, paragraph 3 of the Official Action, the Rule 132 Declaration of applicant has been criticized.

In reply, the reaction temperature of 370 °C in the comparative example is not arbitrarily chosen. Although for carrying out the melamine synthesis by decomposition of urea in a high pressure process, the literature cites wide temperature ranges, e.g. from 325 °C to 450 °C or even much wider ranges, the actual reaction temperature in technical scale is about 370 °C. This temperature of 370 °C was selected since declarant wanted to compare the thus far in technical scale used temperature with the temperature according to his invention.

It is true that the Arrhenius equation indicates that the reaction rate increases with the temperature. But in the present method, not only less hydrolysis of melamine occurs, resulting in higher yield, but there is also an increase of purity. The combination of both effects is not obvious from Arrhenius or from other prior art.

It is further true that the temperature chosen in the present application, i.e. 1 to 50 °C, preferably 1 to 30 °C, and most preferably as close as possible above the melting point of melamine, is within the temperature range cited in the literature and also within the temperature described in cited Canzi. However, the literature and Canzi do not appreciate the essential features of the present invention as discussed below.

In sum, the Declaration presents a fair comparison between representative examples of the present invention and the prior art.

Further, claims 1 to 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Canzi et al. US 5,721,363 in view of Van Hardeveld US 4,408,046 for reasons of record.

This rejection is also respectfully traversed.

Canzi does not teach or suggest to cool to a temperature as close as possible above the melting point of melamine, followed by quenching with an aqueous medium.

Canzi further teaches a "dry" process, where water is not used and is not suggested. Canzi teaches a four step process, wherein in step c), the liquid melamine is allowed to remain at a temperature between 430 °C and the melting point of melamine, preferably between 400 °C and the melting point of melamine (claim 1 and column 2, lines 49 to 51). There is no mention and no suggestion that the temperature should be chosen as close as possible above the melting point. After step c), the temperature of the melamine melt is in step d) reduced to 330 - 270 °C by slow cooling, higher pressures in step c) permitting more rapid cooling rates and vice versa.

According to Canzi, melamine is obtained in powder form (claim 1), and aqueous work up is not suggested.

Van Hardeveld has found a method of using aqueous mother liquors in a melamine-crystallization process, thereby reducing energy consumption and at the same time maintaining a melamine product of acceptable purity. This is achieved by subjecting only a relatively small portion of the liquid stream to the purification treatment (column 2, lines 16 to 24). This advantageous recycle process is applicable to any known method for preparing melamine from urea or thermal decomposition products, from high pressure or medium pressure or low pressure processes (column 2, lines 25 to 29).

Van Hardeveld does not describe or make obvious the teaching of the present claims, i.e. cooling the melamine melt with the addition of ammonia to a temperature, which is as close as possible above the melting point of melamine, depending on the respective ammonia pressure, followed by quenching with water or aqueous ammonia and to form melamine containing solutions or suspensions.

The combined reference teachings do not lead to the present invention.


For the foregoing reasons, it is apparent that the rejections on prior art are untenable and should be withdrawn.

No further issues remaining, allowance of this application is respectfully requested.

If the Examiner has any comments or proposals for expediting prosecution, please contact the undersigned at the telephone number below.

Respectfully submitted,

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